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Michelle B. Lando, Esq.
CABOT CORPORATION
157 Concord Road
Billerica, MA 01821

| EXAMINER | |
|---|---|
| SINES, BRIAN J | |

| ART UNIT | PAPER NUMBER |
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| 1743 | |

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Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/752,656 | MUNOZ ET AL. | |
| | Examiner | Art Unit | |
| | Brian J. Sines | 1743 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *10/25/2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,8-27 and 29-40* is/are rejected.

7)☒ Claim(s) *7 and 28* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 October 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Drawings*

The drawings were received on 10/25/2005. These drawings are acceptable.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

1. Claims 1, 3 – 5 & 8 – 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Maley et al. (U.S. Pat. No. 5,770,028 A).

Regarding claims 1, 3, 10 and 41, Maley et al. teach an electrochemical sensing apparatus comprising: conductive modified particles, such as electrically-conducting carbon or graphite powder particles, having at least one organic group attached, such as an immobilized enzyme, to the particles (see col. 14, lines 12 – 50). Maley et al. do teach that an enzyme may be immobilized *directly* to the carbon or graphite particles via the incorporation of organic functional groups. Maley et al. do teach that any suitable carbon or graphite powder, which readily permits the subsequent immobilization of an enzyme may be used to form the active layer. The carbon particles do comprise organic functional groups, such as carboxylate, amino and sulfur-containing functional groups, on their surface (see col. 14, lines 41 – 50). Maley et al. do teach the use of an electrical measuring apparatus for performing sensor response

measurements (see col. 27, lines 50 – 61). Regarding claims 4, 5, 9 and 11, Maley et al. teach the use of carbon black materials, which are well known in the art to be pigment materials (see col. 15, lines 11 – 21) (see MPEP § 2144.03). Maley et al. teach that the carbon particles may comprise a metal substrate layer coating comprising platinum (see col. 14, lines 51 – 64). Regarding claim 8, Maley et al. teach an aggregate comprising a carbon phase (e.g., carbon black or graphite particles) and a metal-containing phase (e.g., finely divided platinum group metal either deposited or adsorbed onto the carbon or graphite particles) (see col. 14, lines 12 – 50).

As discussed above, Maley et al teach all of the positively recited structural limitations of the claimed apparatus. The Courts have held that a statement of intended use in an apparatus claim fails to distinguish over a prior art apparatus. See *In re Sinex*, 309 F.2d 488, 492, 135 USPQ 302, 305 (CCPA 1962). The Courts have held that the manner of operating an apparatus does not differentiate an apparatus claim from the prior art, if the prior art apparatus teaches all of the structural limitations of the claim. See *Ex Parte Masham*, 2 USPQ2d 1647 (BPAI 1987). Furthermore, the Courts have held that apparatus claims must be structurally distinguishable from the prior art in terms of structure, not function. See *In re Danley*, 120 USPQ 528, 531 (CCPA 1959); and *Hewlett-Packard Co. V. Bausch and Lomb, Inc.*, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (see MPEP § 2114).

2. Claims 1, 3, 6 and 10 are rejected under 35 U.S.C. 102(e) as being anticipated by Dai et al. (U.S. Pat. No. 6,528,020 B1).

Regarding claims 1, 3, 6 and 10, Dai et al. teach a sensing apparatus comprising: conductive modified particles (carbon nanotubes, which are considered to be a carbon product), having at least one organic group attached, such as an immobilized enzyme, to the particles (see

col. 5, lines 32 – 63 & col. 6, lines 1 – 11). Dai et al. teach the incorporation of an electrical measuring apparatus for performing sensor response measurements (see figures 4 – 8; col. 5, lines 17 – 67). Dai et al. teach every positively recited structural limitation of the claimed apparatus. The Courts have held that a statement of intended use in an apparatus claim fails to distinguish over a prior art apparatus. See *In re Sinex*, 309 F.2d 488, 492, 135 USPQ 302, 305 (CCPA 1962). The Courts have held that the manner of operating an apparatus does not differentiate an apparatus claim from the prior art, if the prior art apparatus teaches all of the structural limitations of the claim. See *Ex Parte Masham*, 2 USPQ2d 1647 (BPAI 1987). Furthermore, the Courts have held that apparatus claims must be structurally distinguishable from the prior art in terms of structure, not function. See *In re Danley*, 120 USPQ 528, 531 (CCPA 1959); and *Hewlett-Packard Co. V. Bausch and Lomb, Inc.*, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (see MPEP § 2114).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

1. Claims 2, 22 – 26, 29 – 32 & 33 – 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maley et al.

Regarding claims 2, 22 – 25 and 31, Maley et al. teach an electrochemical sensing apparatus comprising: conductive modified particles, such as electrically-conducting carbon (e.g., carbon black materials) or graphite powder particles, having at least one organic group attached, such as an immobilized enzyme, to the particles (see col. 14, lines 12 – 50; col. 15, lines 11 – 21). Maley et al. do not specifically teach an array of sensors, wherein the array comprises two or more sensors. However, the Courts have held that the mere duplication of parts, without any new or unexpected results, is within the ambit of one of ordinary skill in the art. See *In re Harza*, 124 USPQ 378 (CCPA 1960) (see MPEP § 2144.04). Furthermore, the use of sensing devices incorporating the use of a plurality of sensors arranged in an array configuration are notoriously well known in the art (see MPEP § 2144.03). In addition, the Courts have held that the prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. See *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986) (see MPEP § 2143.02). As a result, a person of ordinary skill in the art would accordingly have had a reasonable expectation of success of incorporating a plurality of sensors within such a sensing apparatus, as taught by Maley et al. Therefore, it would have been obvious to a person of ordinary skill in the art to incorporate an array of sensors within the sensing apparatus, as taught by Maley et al., in order to facilitate, for example, the detection and monitoring of a plurality of different chemical species within an environment. Regarding claims 22, 26, 29 and 32, Maley et al. teach the use of carbon black

materials, which are well known in the art to be aggregated pigment materials (see col. 15, lines 11 – 21) (see MPEP § 2144.03). Regarding claim 30, Maley et al. teach that the carbon particles may further comprise a metal substrate layer coating comprising platinum (see col. 14, lines 51 – 64). Regarding claims 33 – 37, enzymes are proteinaceous materials composed of polymeric peptides well known in the art to comprise various functional organic groups, such as aromatic and ionic groups (see MPEP § 2144.03).

2. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Maley et al. in view of Dai et al. (U.S. Pat. No. 6,528,020 B1). Maley et al. do not specifically teach the incorporation of carbon nanotubes for sensing. Dai et al. do teach the use of carbon nanotubes in a biological sensor, wherein biological molecules, such as an enzyme, can be attached to the nanotube (see col. 5, lines 32 – 43). Dai et al. do recognize that there is a need in the art for sensing devices that provide not only significant and robust, but more advantageously, tunable response to a variety of chemical and biological species (see col. 1, lines 24 – 65). In addition, both of the disclosures of Dai et al. and Maley et al. are directed to sensing devices for detecting glucose. Both of the sensors disclosed by Maley et al. and Dai et al. function in a similar manner based upon using an electrochemical response (see Dai et al., col. 6, lines 1 – 6 & Maley et al., col. 1, lines 1 – 13). Consequently, a person of ordinary skill in the art would have recognized the suitability of incorporating the teachings of Dai et al. with the sensing apparatus of Maley et al. for the intended purpose of facilitating the effective sensing operation of a biological sensor (see MPEP § 2144.07). Furthermore, the Courts have held that the prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. See *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986) (see MPEP

§ 2143.02). As evidenced by Dai et al., carbon nanotubes can be effectively utilized in a biological sensor, wherein the carbon nanotubes have organic or biological molecules, such as an enzyme, attached to the nanotube (see col. 5, lines 32 – 67 & col. 6, lines 1 – 17). Hence, a person of ordinary skill in the art would accordingly have had a reasonable expectation of success in employing the teachings of Dai et al. regarding the use of carbon nanotubes with a biological sensing device, as taught by Maley et al. Therefore, it would have been obvious to a person of ordinary skill in the art to incorporate the use of a carbon nanotube, as taught by Dai et al., with the sensing apparatus, as taught by Maley et al., in order to facilitate effective detection.

3. Claims 1 – 3, 6, 10, 12 – 24, 27, 31 and 33 – 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lewis et al. (U.S Pat. No. 5,571,401) in view of Dai et al. (U.S. Pat. No. 6,528,020 B1).

Regarding claims 1 – 3, 6, 10, 22 – 24, 27 and 31, Lewis et al. teach a sensing apparatus comprising: a first and second sensor electrically connected to an electrical measuring apparatus, wherein the first sensor comprises a region of nonconducting organic polymer material and a region comprising conductive particles, such as carbonaceous materials (e.g., carbon blacks, graphite, etc.); and an electrical path through the regions of nonconducting material and conductive particles (see col. 3, lines 36 – 67 & col. 4, lines 1 – 65). Lewis et al. do teach the incorporation of an electrical measuring apparatus for performing sensor response measurements based upon electrical resistance (see, e.g., col. 3, lines 24 – 66; col. 7, lines 40 – 57). Lewis et al. do not specifically teach that the conductive modified particles comprise carbon products having at least one organic group attached to the particles. Dai et al. do teach the use of carbon nanotubes, which is considered a carbon product, in electrochemical sensors. Dai et al. do

recognize that there is a need in the art for sensing devices that provide not only significant and robust, but more advantageously, tunable response to a variety of chemical and biological species (see col. 1, lines 24 – 65). Dai et al. further teach that the nanotubes can be physically or chemically modified, so as to be tailored for a particular sensing application. Dai et al. teach that sensing agents can be deposited onto the nanotubes so that sensitivity to a wide range of chemical species can be achieved (see col. 4, line 66 – col. 5, line 6). Dai et al. teach a sensing apparatus comprising: conductive modified particles (carbon nanotubes, which are considered to be a carbon product), having at least one organic group attached, such as an immobilized enzyme, to the particles (see col. 5, lines 32 – 63 & col. 6, lines 1 – 11). The Courts have held that the selection of a known material based upon its suitability for the intended use is within the ambit of one of ordinary skill in the art. See *In re Leshin*, 125 USPQ 416 (CCPA 1960) (see MPEP § 2144.07). Furthermore, the Courts have held that the prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. See *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986) (see MPEP § 2143.02). As evidenced by Dai et al., organic polymers can be attached or deposited onto the nanotubes and thereby serve as effective sensing agents (see col. 6, lines 1 – 16). Therefore, it would have been obvious to a person of ordinary skill in the art to incorporate the teachings of Dai et al. with the sensing apparatus of Lewis et al. Regarding claims 12, 13, 15, 16, 33, 34, 36 and 37, Dai et al. teach the incorporation of various polymers, such as polymethylmethacrylate, or biomolecules, such as enzymes, which are well known in the art to be proteinaceous materials comprising various organic functional groups (see col. 5, lines 43 – 50 & col. 6, lines 1 – 11) (see MPEP § 2144.03). Regarding claims 14 and 35, Dai et al. teach the incorporation of a thiol

functional group (see col. 5, lines 33 – 63). Regarding claim 17, Lewis et al. teach that each sensor provides a different response for the same analyte with a detector that is operatively associated with each sensor (see col. 7, lines 3 – 58). Regarding claim 18, Lewis et al. teach that the sensing elements for each sensor are compositionally different from each other (see col. 3, lines 40 – 48; col. 6, lines 9 – 28).

Regarding claims 19 – 21 and 38 – 40, as discussed above, Lewis et al. in view of Dai et al. teach all of the positively recited structure of the apparatus recited in the claimed method, which merely recites the conventional operation of that structure. Furthermore, Lewis et al. do teach that the method and apparatus essentially comprise a means for comparing the response with a library of responses to match the response in order to determine the presence of an analyte or the concentration of the analyte (see col. 7, line 23 – col. 8, line 17). Therefore, it would have been obvious to a person of ordinary skill in the art to perform the method recited in the instant claims upon the apparatus of Lewis et al. in view of Dai et al., as such is the intended operation of that apparatus.

4. Claims 25, 26 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lewis et al. in view of Dai et al., as applied to claims 1 – 3, 6, 10, 12 – 24, 27, 31 and 33 – 40 above, and further in view of Foulger et al. (U.S. Pat. No. 6,315,956 B1).

Regarding claim 25, Lewis et al. do teach the incorporation of carbon black, as a particulate conductive or conductive filler material, within the matrix of nonconductive organic polymer material comprising the sensing material (see col. 3, line 40 – col. 4, line 34). However, Neither Lewis et al. nor Dai et al. specifically teach that the conductive particles comprise

carbon black having attached at least one organic group. Foulger et al. do teach the use of conductive filler materials comprising, inter alia, carbon black and carbon nanotubes, within an electrochemical sensor, in which the sensitivity and dynamic range of the electrochemical sensor is highly dependent on the conductive filler material. Foulger et al. teach that the conductive filler material may be any suitable material exhibiting conductivity and should have a structure which results in an inherently high conductivity with an affinity to develop a strong network (see col. 10, lines 10 – 67). The Courts have held that the selection of a known material, which is based upon its suitability for the intended use, is within the ambit of one of ordinary skill in the art. See *In re Leshin*, 125 USPQ 416 (CCPA 1960) (see MPEP § 2144.07). Furthermore, a person of ordinary skill in the art would have recognized the functional equivalence of carbon black and carbon nanotube materials, as a particulate conductive or filler material used in sensing applications (see MEP § 2144.06). The Courts have held that an express suggestion to substitute one equivalent component or process for another is not necessary to render such a substitution obvious. See *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982). Therefore, it would have been obvious to a person of ordinary skill in the art to substitute and incorporate the known equivalent carbon black material, as taught by Foulger et al., having an attached organic group, as taught by Dai et al., with the sensing apparatus of Lewis et al. in order, for example, to provide for effective sensing operation. Regarding claim 26, it is well known in the art that carbon black is a pigment material (see MPEP § 2144.03). Regarding claim 30, Dai et al. that the carbon nanotubes may be coated with metal particles, which impart sensitivity to a particular chemical species (see col. 2, lines 28 – 32). In view of the discussion above with respect to the recognized functional equivalence among carbon black and carbon nanotube materials as is

generally known in the art, it would have been obvious to a person of ordinary skill in the art to incorporate conductive particles comprising at least partially coated carbon black materials within the sensing apparatus in order to provide for optimal sensor operation for a particular sensing application.

***Response to Arguments***

1. Regarding the rejection of claims 1, 3 – 5 & 8 – 11 under 35 U.S.C. 102(b) as being anticipated by Maley et al. (U.S. Pat. No. 5,770,028 A), the applicants arguments are not persuasive. The applicant alleges that Maley et al. does not teach or suggest that the particles include carbon products. However, as evidenced by Maley et al., the carbon or graphite powder particles disclosed by Maley et al. can be reasonably and broadly interpreted as being "carbon products," as would be understood by a person of ordinary skill in the art (see col. 14, lines 12 – 32). It is well settled that the United States Patent and Trademark Office (PTO) is obligated to give a disputed claim term its broadest reasonable interpretation, taking into account any enlightenment by way of definitions or otherwise found in the specification. See *In re Bigio*, 381 F.3d 1320, 1324, 72 USPQ2d 1209, 1211 (Fed. Cir. 2004) ("[T]he PTO gives a disputed claim term its broadest reasonable interpretation during patent prosecution."). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993); *In re Barr*, 170 USPQ 330 (CCPA 1971). The applicant cannot read limitations set forth in the description into the claims for the purpose of avoiding the art. See *In re Sporck*, 155 USPQ 687 (CCPA 1967). The claims must be given their broadest reasonable interpretation consistent with the supporting description. See *In re Hyatt*, 54 USPQ2d 1664, 1667 (Fed. Cir. 2000). "The PTO applies to the

verbiage of the proposed claims the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art." See *In re Morris*, 127 F.3d 1048, 1054, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997). "During patent examination the pending claims must be interpreted as broadly as their terms reasonably allow." See *In re Zletz*, 893 F.2d 319, 321-22, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989). "The PTO broadly interprets claims during examination of a patent application since the applicant may 'amend his claim to obtain protection commensurate with his actual contribution to the art.'"(quoting *In re Prater*, 415 F.2d 1393, 1404-05, 162 USPQ 541, 550 (CCPA 1969)). See *In re Yamamoto*, 740 F.2d 1569, 1571, 222 USPQ 934, 936 (Fed. Cir. 1984). Although the apparatus as taught by the prior art may not be what the applicant intends as their claimed invention, the claims still encompass, and thereby do not exclude, the teachings of the prior art.

The amended functional limitation reciting that the conductive modified particles have a preexisting resistance does not define the claimed apparatus over the prior art. As discussed above, since the prior art teaches the same structure and composition for the apparatus as specifically recited in the claim, these recited properties are considered inherent. Regarding product and apparatus claims, when the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (see MPEP § 2112.01). The Courts have held that it is well settled that where there is a reason to believe that a functional characteristic would be inherent in the prior art, the burden of proof then shifts to the applicant to provide objective evidence to the contrary. See *In re Schreiber*, 128 F.3d at 1478, 44 USPQ2d at 1478, 44 USPQ2d at 1432 (Fed. Cir. 1997).

Furthermore, the applicant alleges that Maley et al. only teaches that the enzyme is adsorbed onto the platinum group metal, and not to any pigment or carbon product. However, the language of claim 1 does not positively recite that the organic groups are *directly* attached to the carbon products. Maley et al. do teach that active layer 96 comprises an enzyme immobilized into an electrically conducting support member, which consists of or comprises a porous layer of resin-bonded carbon or graphite particles. The particles have intimately mixed therewith, or deposited or adsorbed onto the surface of the individual particles prior to bonding to form the layer, a finely divided platinum group metal to form a porous substrate layer onto which the enzyme is adsorbed or *immobilized*, which implies covalent attachment (see col. 14, lines 11 – 33). Enzymes are well known in the art to be proteinaceous materials, which comprise various organic functional groups (see MPEP § 2144.03). The language of claim 1, for example, does not exclude what may constitute the attachment means, be it either via an adsorption or covalent means, of the organic group to the particles. Maley et al. do also teach the incorporation of carbon black materials (see col. 15, lines 11 – 21). It is well known in the art that carbon black is a pigment material (see MPEP § 2144.03). Maley et al. do teach that an enzyme may be immobilized *directly* to the carbon or graphite particles via the incorporation of organic functional groups. Maley et al. do teach that any suitable carbon or graphite powder, which readily permits the subsequent immobilization of an enzyme may be used to form the active layer. The carbon particles do comprise organic functional groups, such as carboxylate, amino and sulfur-containing functional groups, on their surface (see col. 14, lines 41 – 50). Therefore, Maley et al. unequivocally teach the direct attachment of an organic functional group on the surface of the conductive carbon products. The applicant argues that these disclosed

groups are not organic groups like alkyl or aromatic groups. However, the language of claim 1 does not exclude the presence of the functional organic groups disclosed by Maley et al. The language of claim 1 does not positively recite that these functional groups comprise either alkyl or aromatic groups. The applicant's specification teaches the incorporation of various surface modification chemistries for the covalent attachment of other functional groups or ligands to the particles (see p. 12, lines 22 – 34). Hence, the applicant's disclosure is within the scope of the prior art.

With regards to claim 9, the applicant alleges that Maley et al. do not teach that the particles are at least partially coated carbon black. Maley et al. do teach that platinum is deposited or coated onto the carbon black particles with metal loadings in the range of between about 0.1 to about 20.0 percent by weight based on the weight of carbon (see col. 14, line 51 – col. 15, line 21). Therefore, the coated carbon black particles disclosed by Maley et al. meet the limitation of at least being partially coated by the platinum material. It should be noted that the claim language does not exclude complete coating coverage of the carbon black materials by the platinum material.

The applicant further asserts that the materials disclosed by Maley et al., as discussed above, do not constitute an "aggregate" comprising a carbon phase and a metal-containing species phase. The applicant incorporates by reference in the specification U.S. Pat. No. 6,017,980 A (Wang et al.), which describes the aggregate material used in the present invention (see p. 10, lines 1 – 3). Carbon black materials are well known in the art to exist in the form of an aggregate, as evidenced by Wang et al. (see MPEP § 2144.03). Wang et al. teach that "[c]arbon black exists in the form of aggregates. The aggregates, in turn, are formed of carbon

black particles." (see col. 1, lines 20 – 26). As discussed above, Maley et al. do teach the use of carbon black materials (see col. 15, lines 11 – 21). The presence of the finely divided platinum group metal, which is the metal containing species phase, does not appear to alter the aggregated form of the carbon black material disclosed by Maley et al. (see MPEP § 2144.02). Consequently, the scope of the claimed invention as indicated by the language of claim 1 unequivocally still encompasses, and thereby does not exclude, the teachings of Maley et al.

The applicant alleges that the sensor device of Maley et al. is a different type of sensor, which operates using different principles. However, Maley et al. teach every positively recited structural limitation of the claimed apparatus. The Courts have held that a statement of intended use in an apparatus claim fails to distinguish over a prior art apparatus. See *In re Sinex*, 309 F.2d 488, 492, 135 USPQ 302, 305 (CCPA 1962). The Courts have held that the manner of operating an apparatus does not differentiate an apparatus claim from the prior art, if the prior art apparatus teaches all of the structural limitations of the claim. See *Ex Parte Masham*, 2 USPQ2d 1647 (BPAI 1987). Furthermore, the Courts have held that apparatus claims must be structurally distinguishable from the prior art in terms of structure, not function. See *In re Danley*, 120 USPQ 528, 531 (CCPA 1959); and *Hewlett-Packard Co. V. Bausch and Lomb, Inc.*, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (see MPEP § 2114). The applicant is advised to incorporate either "means for" or "configured to" language in the apparatus claims in order to impart patentable weight to a function attributed to a positively recited structural limitation of a claimed apparatus in order to distinguish a claimed apparatus from an apparatus taught by the prior art, which, for example, operates under a different principle.

2. Regarding the rejection of claims 1, 3, 6 & 10 under 35 U.S.C. 102(e) as being anticipated by Dai et al. (U.S. Pat. No. 6,528,020 B1), the applicants arguments are not persuasive. The applicant alleges that Dai et al. do not teach or suggest that, inter alia, the conductive particles include carbon products having attached at least one organic group. Contrary to the assertions of the applicant, Dai et al. do teach that the conductive modified particles (carbon nanotubes, which are considered to be a carbon product), have at least one organic group attached, such as an immobilized enzyme, to the particles (see col. 5, lines 32 – 63 & col. 6, lines 1 – 11). Enzymes are well known in the art to be proteinaceous materials, which comprise various organic functional groups (see MPEP § 2144.03). In addition, Dai et al. teach that biological molecules, such as enzymes, may linked to the gold-coated carbon nanotubes via a thiol linkage (see col. 5, lines 32 – 42). Dai et al. teaches that the carbon nanotubes may be coated with metal particles (see col. 2, lines 28 – 32). The applicant's specification teaches the incorporation of various surface modification chemistries for the covalent attachment of other functional groups or ligands to the particles (see p. 12, lines 22 – 34). The prior art teaches the same concept of direct attachment utilizing functional chemistry as disclosed by the applicant's specification. Hence, the applicant's disclosure is within the scope of the prior art.

The amended functional limitation reciting that the conductive modified particles have a preexisting resistance does not define the claimed apparatus over the prior art. As discussed above, since the prior art teaches the same structure and composition for the apparatus as specifically recited in the claim, these recited properties are considered inherent. Regarding product and apparatus claims, when the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (see MPEP §

2112.01). The Courts have held that it is well settled that where there is a reason to believe that a functional characteristic would be inherent in the prior art, the burden of proof then shifts to the applicant to provide objective evidence to the contrary. See *In re Schreiber*, 128 F.3d at 1478, 44 USPQ2d at 1478, 44 USPQ2d at 1432 (Fed. Cir. 1997). The applicant is advised to incorporate either "means for" or "configured to" language in the apparatus claims in order to impart patentable weight to a function attributed to a positively recited structural limitation of a claimed apparatus in order to distinguish a claimed apparatus from an apparatus taught by the prior art, which, for example, operates under a different principle.

3. Regarding the rejection of claims 2, 22 – 26, 29 – 32 & 33 – 37 under 35 U.S.C. 103(a) as being unpatentable over Maley et al., the applicants arguments are not persuasive. This rejection is maintained. However, the rejection of claims 19 – 21 and 38 – 40 under 35 U.S.C. 103(a) as being unpatentable over Maley et al. has been withdrawn.

The applicant alleges essentially that a person of ordinary skill in the art would have been incapable of contemplating a sensor in an array configuration comprising a plurality of sensors. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Claim 2 merely recites a plurality of sensor elements. Although Maley et al. do not specifically teach an array of sensors, wherein the array comprises two or more sensors, the Courts have held that the mere duplication of parts, without any new or unexpected results, is within the ambit of one of ordinary skill in the art. See *In re Harza*, 124 USPQ 378 (CCPA 1960) (see MPEP § 2144.04). The applicant is advised that legal precedent may be utilized as a source of rationale in supporting an obviousness rejection under 35 U.S.C. 103 (see MPEP § 2144). Furthermore, the use of sensing devices incorporating the use of a plurality of sensors arranged in an array configuration are notoriously well known in the art, for example, as evidenced by Lewis et al. (U.S. Pat. No. 5,571,401 A) (see MPEP § 2144.03). Lewis et al. do teach a sensor system comprising an array configuration having a plurality of sensor elements (see col. 2, lines 27 – 39). In addition, the Courts have held that the prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. See *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986) (see MPEP § 2143.02). As a result, a person of ordinary skill in the art would accordingly have had a reasonable expectation of success of incorporating a plurality of sensors within such a sensing apparatus, as taught by Maley et al. Therefore, it would have been obvious to a person of ordinary skill in the art to incorporate an array of sensors within the sensing apparatus, as taught by Maley et al., in order to facilitate, for example, the detection and monitoring of a plurality of different chemical species within an environment. Regarding claims 5 and 11, it is well known in the art that carbon black is a pigment material (see MPEP § 2144.03).

The applicant further argues that not every sensor can operate as a plurality of sensors arranged in an array configuration. However, the applicant provides no evidence for this

argument specifically in regards to the Maley et al. disclosure. An argument does not replace evidence, where evidence is necessary (see MPEP § 2145). The Courts have held that the arguments of counsel cannot take the place of evidence in the record. See *In re Schulze*, 346 F.2d 600, 602, 145 USPQ 716, 718 (CCPA 1965); & *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997).

4. Regarding the rejection of claim 6 under 35 U.S.C. 103(a) as being unpatentable over Maley et al. in view of Dai et al., the applicants arguments are not persuasive. The applicant essentially alleges that a person of ordinary skill in the art would have been incapable of contemplating the incorporation of carbon nanotubes as a part of a sensing element, as disclosed by Dai et al., for a sensor, as taught by Maley et al.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Although Maley et al. do not specifically teach the incorporation of carbon nanotubes for sensing, Dai et al. do teach the use of carbon nanotubes in a biological sensor, wherein biological molecules, such as an enzyme, can be attached to the nanotube (see col. 5, lines 32 – 43). Carbon nanotubes are reasonably considered particles. Dai et al. do recognize that there is a need in the

art for sensing devices that provide not only significant and robust, but more advantageously, tunable response to a variety of chemical and biological species (see col. 1, lines 24 – 65). The applicant alleges that the technologies employed by Dai et al. and Maley et al. are very different. However, contrary to the assertions of the applicant, both of the disclosures of Dai et al. and Maley et al. are directed to electrochemical sensing devices for detecting glucose. Both of the sensors disclosed by Maley et al. and Dai et al. function in a similar manner based upon using an electrochemical response (see Dai et al., col. 6, lines 1 – 6 & Maley et al., col. 1, lines 1 – 13). Dai et al. teach a carbon nanotube, which is a carbon product, with a gold metal coating to which a biological molecule, such as an enzyme may be immobilized (see col. 5, lines 32 – 43). In a similar manner, Maley et al. teach a carbon black material with a platinum coating to which an enzyme can be immoblilized (see col. 14, line 12 – col. 15, line 63). Consequently, a person of ordinary skill in the art would have reasonably recognized the suitability of incorporating the teachings of the utilization of carbon nanotubes with the recognized benefits, as disclosed by Dai et al., with the sensing apparatus of Maley et al., for the intended purpose of facilitating the effective sensing operation of a biological sensor. The Courts have held that the selection of a known material, which is based upon its suitability for the intended use, is within the ambit of one of ordinary skill in the art. See *In re Leshin*, 125 USPQ 416 (CCPA 1960) (see MPEP § 2144.07). Furthermore, the Courts have held that the prior art can be modified or combined to reject claims as *prima facie* obvious as long as there is a reasonable expectation of success. See *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986) (see MPEP § 2143.02). As evidenced by Dai et al., carbon nanotubes can be effectively utilized in an electrochemical biological sensor, wherein the carbon nanotubes have organic or biological molecules, such as an

enzyme, attached to the nanotube (see col. 5, lines 32 – 67 & col. 6, lines 1 – 17). Hence, a person of ordinary skill in the art would accordingly have had a reasonable expectation of success in employing the teachings of Dai et al. regarding the use of carbon nanotubes with a biological sensing device, as taught by Maley et al. Therefore, it would have been obvious to a person of ordinary skill in the art to incorporate the use of a carbon nanotube, as taught by Dai et al., with the sensing apparatus, as taught by Maley et al., in order to facilitate effective detection.

5. Regarding the rejection of claims 1 – 3, 6, 10, 12 – 24, 27, 31 & 33 – 40 under 35 U.S.C. 103(a) as being unpatentable over Lewis et al. in view of Dai et al., the applicants arguments are not persuasive.

The applicant argues that the prior art does not teach what constitutes a conductive modified particle as disclosed in the applicant's specification. However, as discussed above, Lewis et al. in view of Dai et al. teach the claimed invention as specifically recited in the claims. It is well settled that the United States Patent and Trademark Office (PTO) is obligated to give a disputed claim term its broadest reasonable interpretation, taking into account any enlightenment by way of definitions or otherwise found in the specification. See *In re Bigio*, 381 F.3d 1320, 1324, 72 USPQ2d 1209, 1211 (Fed. Cir. 2004) ("[T]he PTO gives a disputed claim term its broadest reasonable interpretation during patent prosecution."). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993); *In re Barr*, 170 USPQ 330 (CCPA 1971). The applicant cannot read limitations set forth in the description into the claims for the purpose of avoiding the art. See *In re Sporck*, 155 USPQ 687 (CCPA 1967).

"The PTO applies to the verbiage of the proposed claims the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art." See *In re Morris*, 127 F.3d 1048, 1054, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997). "During patent examination the pending claims must be interpreted as broadly as their terms reasonably allow." See *In re Zletz*, 893 F.2d 319, 321-22, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989). "The PTO broadly interprets claims during examination of a patent application since the applicant may 'amend his claim to obtain protection commensurate with his actual contribution to the art.'"(quoting *In re Prater*, 415 F.2d 1393, 1404-05, 162 USPQ 541, 550 (CCPA 1969)). See *In re Yamamoto*, 740 F.2d 1569, 1571, 222 USPQ 934, 936 (Fed. Cir. 1984). Although the apparatus as taught by the prior art may not be what the applicant intends as their claimed invention, the claims still encompass the teachings of the prior art. Therefore, the claims still do not *exclude* the teachings of the prior art.

Regarding applicant's arguments directed to the direct attachment of organic groups to the particles, the applicant's specification teaches the incorporation of various surface modification chemistries for the covalent attachment of other functional groups or ligands to the particles (see p. 12, lines 22 – 34). The prior art teaches the same concept of direct attachment utilizing functional chemistry as disclosed by the applicant's specification. Hence, the applicant's disclosure is within the scope of the prior art.

The amended functional limitation reciting that the conductive modified particles have a preexisting resistance does not define the claimed apparatus over the prior art. As discussed above, since the prior art teaches the same structure and composition for the apparatus as specifically recited in the claim, these recited properties are considered inherent. Regarding

product and apparatus claims, when the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (see MPEP § 2112.01). The Courts have held that it is well settled that where there is a reason to believe that a functional characteristic would be inherent in the prior art, the burden of proof then shifts to the applicant to provide objective evidence to the contrary. See *In re Schreiber*, 128 F.3d at 1478, 44 USPQ2d at 1478, 44 USPQ2d at 1432 (Fed. Cir. 1997).

6. Regarding the rejection of claims 25, 26 & 30 under 35 U.S.C. 103(a) as being unpatentable over Lewis et al. in view of Dai et al. and Foulger et al., the applicants arguments are not persuasive. As discussed above, Lewis et al. in view of Dai et al. and Foulger et al. teach the invention as claimed. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Regarding claim 25, Lewis et al. do teach the incorporation of carbon black, as a particulate conductive or conductive filler material, within the matrix of nonconductive organic polymer material comprising the sensing material (see col. 3, line 40 – col. 4, line 34). However, Neither Lewis et al. nor Dai et al. specifically teach that the conductive particles comprise carbon black having attached at least one organic group. Foulger et al. do teach the use of conductive filler materials comprising, inter alia, carbon black and carbon nanotubes, within an electrochemical sensor, in which the sensitivity and dynamic range of the electrochemical sensor is highly dependent on the conductive filler material. Foulger et al. teach that the conductive filler material

may be any suitable material exhibiting conductivity and should have a structure which results in an inherently high conductivity with an affinity to develop a strong network (see col. 10, lines 10 – 67). The Courts have held that the selection of a known material, which is based upon its suitability for the intended use, is within the ambit of one of ordinary skill in the art. See *In re Leshin*, 125 USPQ 416 (CCPA 1960) (see MPEP § 2144.07). Furthermore, a person of ordinary skill in the art would have recognized the functional equivalence of carbon black and carbon nanotube materials, as a particulate conductive or filler material used in sensing applications (see MEP § 2144.06). The Courts have held that an express suggestion to substitute one equivalent component or process for another is not necessary to render such a substitution obvious. See *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982). Therefore, it would have been obvious to a person of ordinary skill in the art to substitute and incorporate the known equivalent carbon black material, as taught by Foulger et al., having an attached organic group, as taught by Dai et al., with the sensing apparatus of Lewis et al. in order, for example, to provide for effective sensing operation. Regarding claim 26, it is well known in the art that carbon black is a pigment material (see MPEP § 2144.03). Regarding claim 30, Dai et al. that the carbon nanotubes may be coated with metal particles, which impart sensitivity to a particular chemical species (see col. 2, lines 28 – 32). In view of the discussion above with respect to the recognized functional equivalence among carbon black and carbon nanotube materials as is generally known in the art, it would have been obvious to a person of ordinary skill in the art to incorporate conductive particles comprising at least partially coated carbon black materials within the sensing apparatus in order to provide for optimal sensor operation for a particular sensing application.

***Allowable Subject Matter***

Claims 7 and 28 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 7 and 28, the cited prior art neither teach nor fairly suggest that the conductive modified particles comprise an aggregate comprising a carbon phase and a silicon-containing species phase, wherein the aggregate optionally has attached at least one organic group.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian J. Sines, Ph.D. whose telephone number is (571) 272-1263. The examiner can normally be reached on Monday - Friday (11:30 AM - 8 PM EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill A. Warden can be reached on (571) 272-1267. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).